

June 1996



# *Mathematics 33*

## *Grade 12 Diploma Examination*

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**Alberta**  
EDUCATION





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*June 1996*

# **Mathematics 33**

## **Grade 12 Diploma Examination**

### **Description**

Time: 2.5 h. You may take an additional 0.5 h to complete the examination.

This is a **closed-book** examination consisting of

- 37 multiple-choice and 12 numerical-response questions of equal value, worth 70% of the examination
- 4 written-response questions, worth a total of 21 marks or 30% of the examination

Total possible marks: 70

This examination contains sets of related questions

A set of questions may contain multiple-choice and/or numerical-response and/or written-response questions.

When required, a grey bar is used to indicate the end of a set.

A mathematics data booklet is provided for your reference.

The perforated pages at the back of this booklet may be torn out and used for your rough work. No marks will be given for work done on the tear-out pages.

### **Instructions**

- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.
- You are expected to provide your own scientific calculator.
- Use only an HB pencil for the machine-scored answer sheet.
- If you wish to change an answer, erase **all** traces of your first answer.
- Consider all numbers used in the examination to be the result of a measurement or observation.
- Do not fold the answer sheet.
- Now turn this page and read the detailed instructions for answering machine-scored and written-response questions.

## Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

### Example

This examination is for the subject of

- A. mathematics
- B. chemistry
- C. biology
- D. physics

Answer Sheet

● (B) (C) (D)

## Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- If an answer is a value between 0 and 1 (e.g., 0.25), then be sure to record the 0 before the decimal place.
- Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.

### Example 1

The value of  $\tan 35^\circ$  to the nearest tenth is

\_\_\_\_\_.

Value: 0.7002075

Value to be recorded: 0.7

Record 0.7 on the  
answer sheet

0	.	7	
---	---	---	--

●	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	●	7
8	8	8	8
9	9	9	9



### Example 2

The  $y$ -intercept for the quadratic function  $y = 2x^2 + 7x + 32$  is \_\_\_\_\_.

(Record your answer on the answer sheet.)

Value to be recorded: 32

Record 32 on the  
answer sheet

3	2		
•	•		
0	0	0	0
1	1	1	1
2	•	2	2
•	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

### Example 3

If an annual interest rate of 7% is compounded quarterly, then the quarterly rate to the nearest hundredth of a percent, is \_\_\_\_\_%.

(Record your answer on the answer sheet.)

Value to be recorded: 1.75

Record 1.75 on the  
answer sheet

1	.	7	5
•	•		
0	0	0	0
•	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	•
6	6	6	6
7	7	•	7
8	8	8	8
9	9	9	9

## Written Response

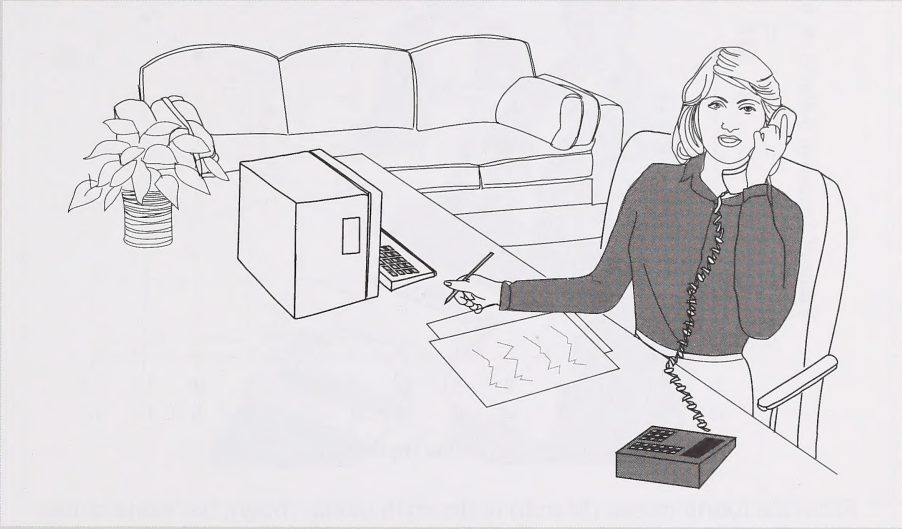
- Write your answers in the examination booklet as neatly as possible.
- For full marks, your answers must be well organized and address **all** the main points of the question.
- Descriptions and/or explanations of concepts must be correct and reflect pertinent ideas, calculations, and formulas.
- Your answers **should be** presented in a well-organized manner using complete sentences for a written response, and correct units for a numerical response.



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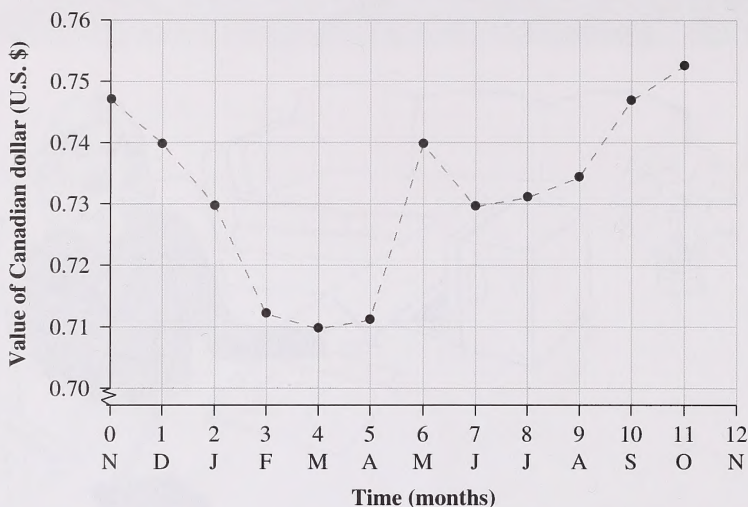
## CONSUMERISM

Dawn is a financial advisor. She constantly uses mathematics to make decisions related to her customers' investment and banking opportunities. Answer the following questions related to Dawn's experiences.



Use the following information to answer the next two questions.

Dawn often analyzed graphs to determine the best time of the year to exchange currency. The graph below indicates the value of the Canadian dollar in U.S. dollars over a period of 12 months.



From the fourth month (March) to the sixth month (May), the value of the Canadian dollar *i* by an amount equal to \$ *ii*, relative to the U.S. dollar.

1. The **correct** word for *i* is

- A. increased
- B. decreased
- C. amortized
- D. matured

### Numerical Response

1. The numerical value for *ii*, to the nearest hundredth of a dollar, is \$\_\_\_\_\_.  
(Record your answer on the answer sheet.)



*Use the following information to answer the next question.*

In order to save money in an annuity, Dawn advised Mr. and Mrs. Bartel to invest \$500.00 at the beginning of every month for 28 months.



2. If the investment earns  $1\frac{1}{2}\%$  per month, the amount of the annuity at the end of the 28 months will be
- A. \$11 363.36
  - B. \$14 000.00
  - C. \$16 740.74
  - D. \$17 499.35
- 

*Use the following information to answer the next question.*

Dawn arranged a \$120 000 mortgage for the Kim family. The Kims mortgaged their new home for 10 years at a rate of  $9\frac{1}{2}\%$  per annum.

### **Numerical Response**

2. The Kims' monthly payment, to the nearest dollar, will be \$\_\_\_\_\_.  
(Record your answer on the answer sheet.)

Use the following information to answer the next two questions.

Dawn organized an annuity for another customer. Starting in January, every six months, the customer will deposit \$1 000 into an annuity that pays interest at 6% per annum, compounded semi-annually. Entries related to this annuity, for a 2-year period, are shown below.

Payment Period	Regular Payment	New Balance	Interest per Period	Final Balance
1	\$1 000	\$1 000.00	$\$1\,000 \times 0.03 = \$30.00$	\$1 030.00
2	\$1 000	\$2 030.00	$\$2\,030 \times 0.03 = \$60.90$	\$2 090.90
3	\$1 000	\$3 090.90	<i>i</i>	.....
4	\$1 000	.....	<i>ii</i>	<i>iii</i>

3. The value of *i*, the interest for payment period 3, is

- A. \$92.73
- B. \$91.80
- C. \$90.90
- D. \$90.30

### Numerical Response

3. To the nearest dollar, the value of the final balance *iii* is \$\_\_\_\_\_.  
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

Dawn prepared a customer survey that asked, “Would you use RRSP funds to purchase a new home?” Of the people in the community, 80% answered “yes.”

4. Based on these results and using a 90% confidence interval, how many people from a random sample of 40 would respond “yes” to this survey question?
- A. Between 13 and 19
  - B. Between 23 and 38
  - C. Between 28 and 36
  - D. Between 70 and 85



*Use the following information to answer the next question.*

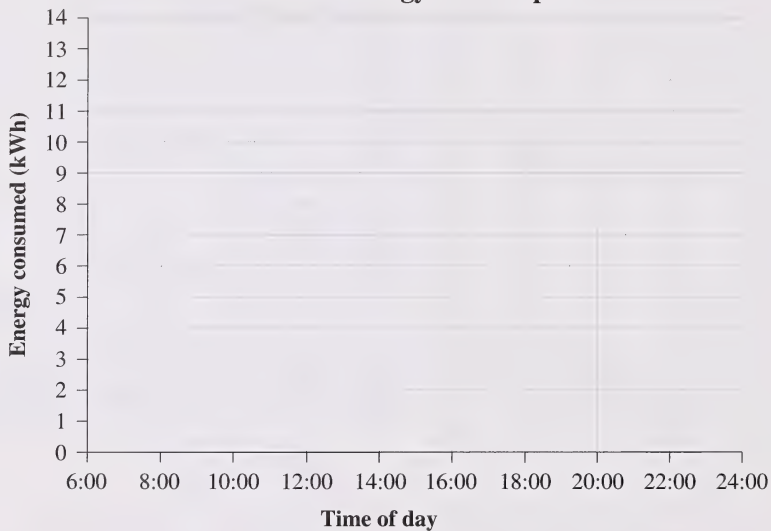
To find ways of realizing savings, Dawn conducted a detailed analysis of electrical energy consumption. Use your graphing and analytical skills to answer the next question.

**Written Response — 7 marks**

1. a. Given the following data of electrical energy consumption at the end of two-hour periods during a summer day, graph the relation between energy used and time of day.

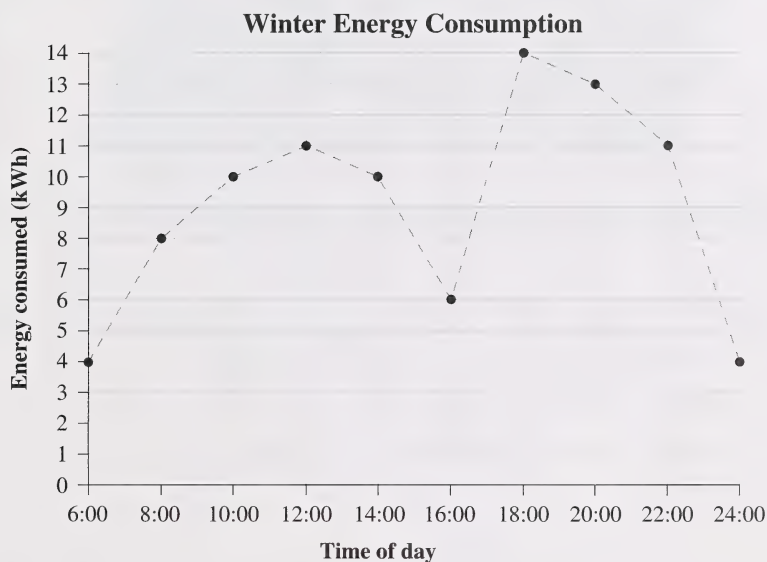
Time of day	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00	24:00
Energy consumed (kWh)	2	7	8	10	9	4	14	7	8	3

**Summer Energy Consumption**



- b. Identify one period of time when energy consumption increased and one period of time when energy consumption decreased, and describe possible causes for these changes.

- c. In a random survey, 72 of 80 homeowners agreed that the data given for summer energy consumption was typical of their energy consumption on a summer day. Use these results and refer to the 90% box plots to write a generalization about summer energy consumption by the population of homeowners as a whole.
- d. A graph of energy consumption for winter is given below. Compare the summer energy consumption graph with this winter energy consumption graph.



## TECHNOLOGY

Robert and Lim used current technologies to assist in analyzing, interpreting, and exploring equations and their graphical representations. Answer the next twelve questions related to equations and graphs.

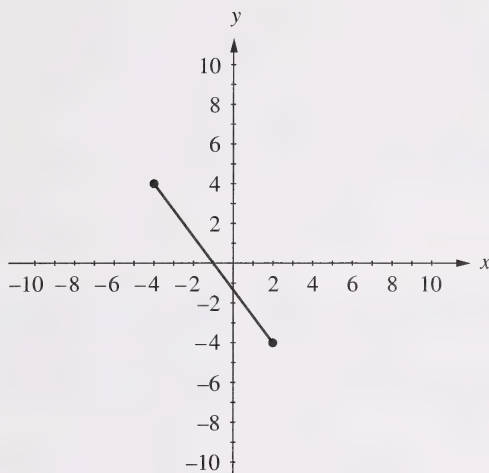


5. Lim transformed the exponential function  $f(x) = 2^x$  so that its graph was reflected in the  $x$ -axis and shifted down 3 units. The equation of the graph is
- A.  $f(x) = 3(2)^x$
  - B.  $f(x) = -3(2)^x$
  - C.  $f(x) = (2)^x - 3$
  - D.  $f(x) = -(2)^x - 3$



Use the following information to answer the next question.

Lim displayed a graph of another function, as shown below.



6. The graph suggests that the domain and range of the function are

A. Domain:  $-4 \geq x \geq 4$

Range:  $-4 \geq y \geq 2$

B. Domain:  $-4 \geq x \geq 2$

Range:  $-4 \geq y \geq 4$

C. Domain:  $-4 \leq x \leq 4$

Range:  $-4 \leq y \leq 2$

D. Domain:  $-4 \leq x \leq 2$

Range:  $-4 \leq y \leq 4$

Use the following information to answer the next question.

Lim used  $f(x) = 4x^2 + x + 7$  to determine an ordered pair.

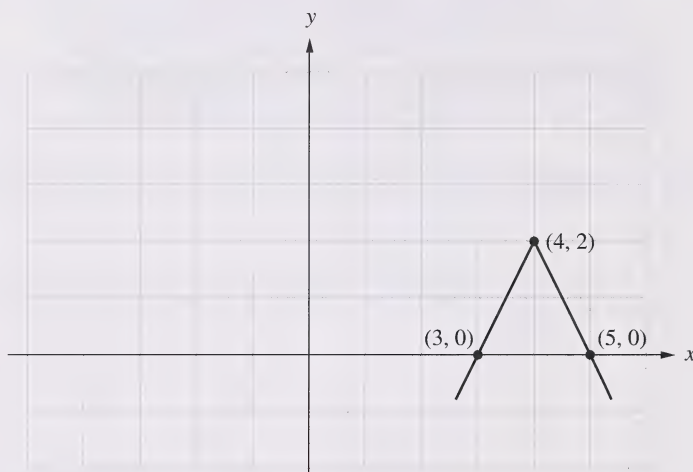
**Numerical Response**

4. The value of  $f(1)$ , to the nearest tenth, is \_\_\_\_\_.  
(Record your answer on the answer sheet.)

\_\_\_\_\_

Use the following information to answer the next question.

Robert graphed an absolute value function, as shown below.



**Numerical Response**

5. If the graph represents the equation  $y = a|x - b| + k$ , then the value of  $b$ , correct to the nearest tenth, is \_\_\_\_\_.  
(Record your answer on the answer sheet.)

7. For the function  $f(x) = \frac{x+2}{x-4}$ , the domain is the set of all real numbers **except** for the number
- A. -4
  - B. -2
  - C. 4
  - D. 2

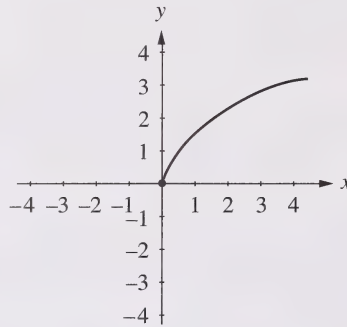
### Numerical Response

6. When the cubic function  $f(x) = x^3$  is transformed to  $f(x) = 53.1(x - 12.8)^3 + 15.7$ , the amount of horizontal shift of the corresponding graph is \_\_\_\_\_ units.  
(Record your answer on the answer sheet.)



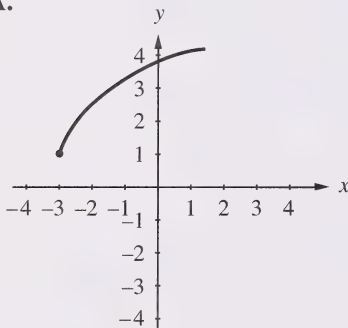
Use the following information to answer the next question.

Starting with the graph of  $y = f(x)$  pictured below, Lim discovered that changing the values of  $a$ ,  $b$ , and  $c$  in the equation  $y = c \cdot f(x - a) + b$  transformed the graph.

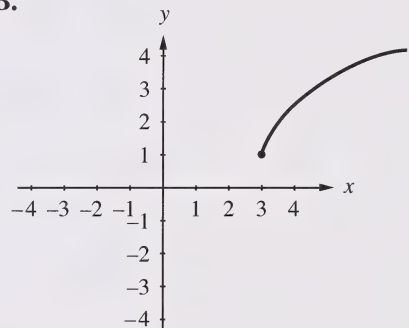


8. If  $y = f(x)$  is changed to  $y = f(x - 3) + 1$ , then the transformed graph is

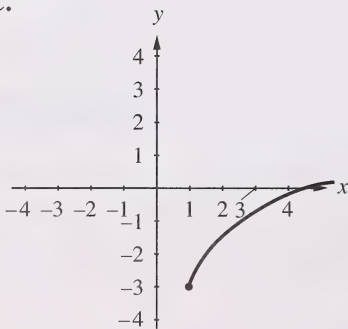
A.



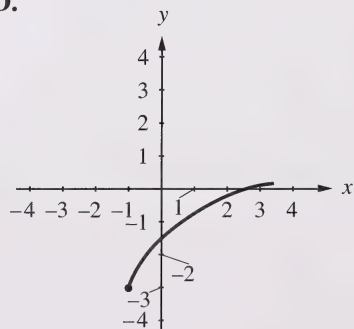
B.



C.

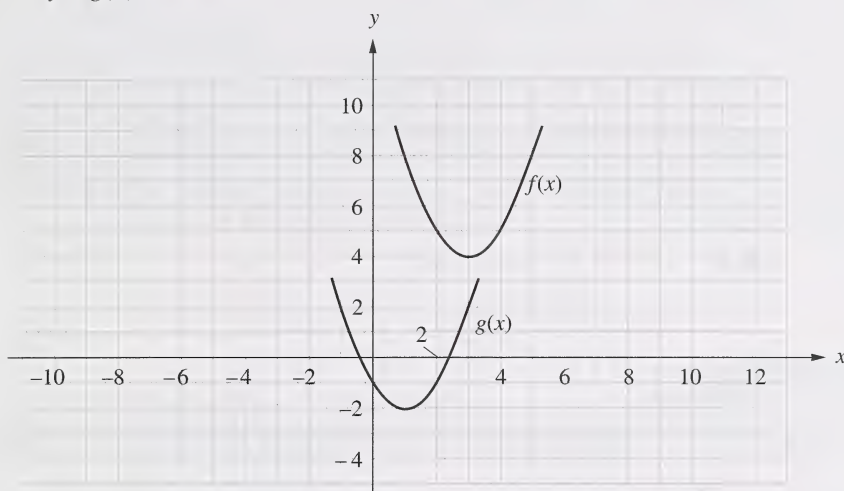


D.



Use the following information to answer the next question.

Robert displayed the parabola  $y = f(x)$  and transformed it to the graph of  $y = g(x)$ , as shown below.



9. Which statement describes how the graph of  $g(x)$  is obtained from the graph of  $f(x)$ ?
- A. The graph of  $f(x)$  is shifted vertically upward by 6 units and horizontally left by 2 units.
  - B. The graph of  $f(x)$  is shifted vertically downward by 6 units and horizontally left by 2 units.
  - C. The graph of  $f(x)$  is shifted vertically upward by 6 units and horizontally right by 2 units.
  - D. The graph of  $f(x)$  is shifted vertically downward by 6 units and horizontally right by 2 units.

Use the following information to answer the next four questions.

Given specific information about quadratic functions and equations, Robert and Lim used their abilities to write equations and visualize parabolic graphs.

10. The vertex of the graph of the function  $f(x) = (x - 3)^2 - k$  is at
- A.  $(3, -k)$
  - B.  $(3, k)$
  - C.  $(-3, -k)$
  - D.  $(-3, k)$

### Numerical Response

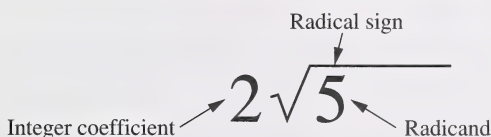
7. The graph of the quadratic function  $f(x) = -(x - 2)^2 + 5$  has an axis of symmetry of  $x = \underline{\hspace{2cm}}$ .  
(Record your answer on the answer sheet.)
11. If a quadratic function has a maximum value of  $h$  and its graph has an axis of symmetry of  $x = 3$ , then the function could be
- A.  $f(x) = -(x + 3)^2 + h$
  - B.  $f(x) = -(x - h)^2 + 3$
  - C.  $f(x) = -(x - 3)^2 + h$
  - D.  $f(x) = -(x + h)^2 + 3$
12. If two roots of a quadratic equation are  $\frac{2}{3}$  and  $-1$ , then a possible quadratic equation is
- A.  $3x^2 + x - 2 = 0$
  - B.  $3x^2 - x - 2 = 0$
  - C.  $2x^2 - x - 3 = 0$
  - D.  $2x^2 + x - 3 = 0$



## CONNECTIONS

Whenever Michelle did peer tutoring, she tried to link new learnings with previous mathematics studied. For example, Michelle linked factoring and procedures learned to simplify fractions to show how rational expressions can be simplified.

In explaining operations involving radicals, Michelle used the illustration below to describe parts of a radical term.



13. When  $\sqrt{18}$  is expressed as a mixed radical in simplest form with an integer coefficient, the **radicand** is
- A.  $\sqrt{3}$
  - B. 2
  - C. 3
  - D. 9
14. In simplified form, the integer coefficient of  $3\sqrt{8} + 2\sqrt{18} - 4\sqrt{98}$  is
- A. 16
  - B. 1
  - C. -1
  - D. -16

## Numerical Response

8. In math class, Michelle helped Bobby-Joe to write  $\sqrt{75} + \sqrt{48} - \sqrt{12}$  in the form  $a\sqrt{b}$ , where  $a$  and  $b$  are positive integers. The value of  $a$  is \_\_\_\_\_. (Record your answer on the answer sheet.)

Use the following information to answer the next question.

Michelle noted that procedures learned previously to multiply polynomials, such as

$$(2x)(3x + 4) = 6x^2 + 8x,$$

can also be used to multiply radicals.

15. The product of  $2\sqrt{3}(3\sqrt{2} + 5)$  can be written in the form  $a\sqrt{b} + c\sqrt{d}$ , where  $a$ ,  $b$ ,  $c$ , and  $d$  are whole numbers. A possible value for one of the terms is

- A.  $2\sqrt{15}$
  - B.  $6\sqrt{5}$
  - C.  $7\sqrt{3}$
  - D.  $6\sqrt{6}$
- 

16. If  $\frac{40}{4\sqrt{5}}$  is written as  $a\sqrt{b}$ , where  $a$  and  $b$  are whole numbers, then the value of  $a$  is

- A. 2
- B. 5
- C. 10
- D. 20

**Written Response — 4 marks**

*Use the following information to answer the next question.*

Bobby-Joe found this radical problem in her textbook.

$$\text{Simplify } \sqrt{50} + \sqrt{27} - \sqrt{8} - 2\sqrt{75}$$

- 2.** Bobby-Joe began to solve the problem with the following incomplete statement. Complete the solution to the problem and leave your final answer in simplest radical form.

$$\begin{aligned} \text{Answer: } &= \sqrt{25 \times 2} + \sqrt{9 \times 3} - \sqrt{4 \times 2} - 2\sqrt{\phantom{00}} \\ &= \phantom{\sqrt{25 \times 2} + \sqrt{9 \times 3} - \sqrt{4 \times 2} - 2\sqrt{\phantom{00}}} \\ &= \phantom{\sqrt{25 \times 2} + \sqrt{9 \times 3} - \sqrt{4 \times 2} - 2\sqrt{\phantom{00}}} \\ &= \phantom{\sqrt{25 \times 2} + \sqrt{9 \times 3} - \sqrt{4 \times 2} - 2\sqrt{\phantom{00}}} \end{aligned}$$

Explain why your answer in radical form is more accurate than an answer that could be obtained on a calculator in decimal form.





Michelle connected procedures used to solve other equations to help her solve radical equations.

### Numerical Response

9. To the nearest tenth, the solution of  $\sqrt{2x-3} - 5 = -3$  is  $x =$  \_\_\_\_\_.  
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

Michelle used her background in radical equations to solve a problem involving the equation  $I = \sqrt{\frac{P}{R}}$ , where  $R$  is the resistance, in ohms,  $P$  is the power, in watts, and  $I$  is the current, in amperes.

17. If a current  $I$  is 2 amperes and the power  $P$  is 6 watts, then the resistance  $R$  is
- A. 0.7 ohms
  - B. 1.5 ohms
  - C. 3 ohms
  - D. 12 ohms

*Use the following information to answer the next two questions.*

Skills used in factoring polynomials are connected to determining non-permissible values of rational expressions. Use your expertise in this area to solve the next two questions.

18. The non-permissible values of  $x$  for the expression  $\frac{x^2 - 9}{x^2 - 4}$  are

A. 3 and 2  
B. -3 and -2  
C. -2 and 2  
D. -3 and 3

19. A simplified expression for  $\frac{v^2 - 4v}{v^2 - 16}$ , where  $v \neq 4$  or  $-4$ , is

A.  $\frac{v + 2}{v + 4}$   
B.  $\frac{v}{v + 4}$   
C.  $1 + \frac{v}{4}$   
D.  $\frac{v}{4}$

Use the following information to answer the next two questions.

Michelle connected procedures learned to simplify fractions to the problem of simplifying rational expressions. Use this connection whenever possible to solve the next two questions.

20. A simplified form of  $\frac{c^2 - 4c + 3}{2c - 2} \div \frac{c^2 - 9}{4c^2 - 11c - 3}$ , where  $c \neq -3, -\frac{1}{4}, 1$ , or  $3$ , is
- A.  $\frac{4c - 1}{2}$
- B.  $4c^2 + 11c$
- C.  $\frac{(4c + 1)(c - 3)}{2(c + 3)}$
- D.  $\frac{(c + 3)(c + 9)}{2(4c + 3)}$
21. The sum of  $\frac{2}{x + 1} + \frac{3}{x - 2}$ , where  $x \neq -1$  or  $2$ , is
- A.  $5x - 1$
- B.  $\frac{5}{(x + 1)(x - 2)}$
- C.  $\frac{5x - 1}{(x + 1)(x - 2)}$
- D.  $\frac{5}{2x + 1}$

Use your equation-solving skills to identify the steps used to solve a rational equation.

22. A step that would lead to a correct solution of  $\frac{a + 3}{3} = \frac{a + 15}{6}$  is
- A.  $6a + 3 = 3a + 15$
- B.  $6a + 90 = 3a + 9$
- C.  $2a + 3 = a + 15$
- D.  $2a + 6 = a + 15$

## ALBERTA INDUSTRIES

Contractors, manufacturers, technologists, and construction workers constantly solve problems using Mathematics 33 skills. Use your background to solve the following problems.



*Use the following information to answer the next question.*

A contractor borrowed \$17 000 from the bank to purchase new construction equipment. The bank charged interest at a rate of 12% per annum compounded monthly.

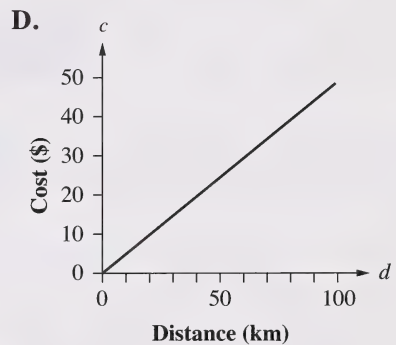
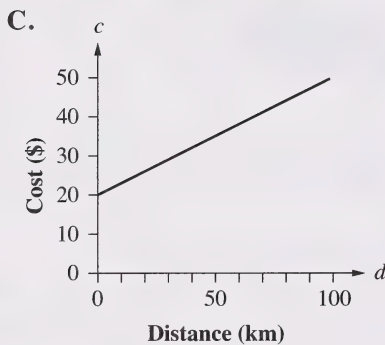
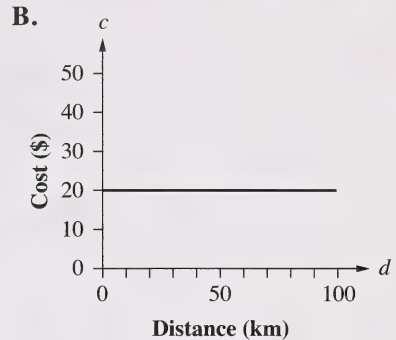
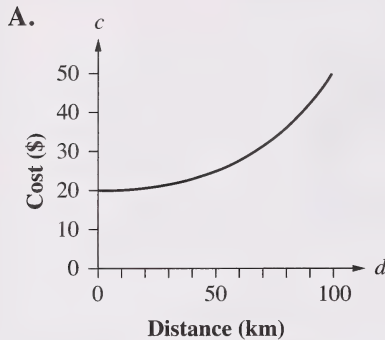
23. To pay the loan back over 3 years, the contractor will need to make monthly payments at the end of each month of
- A. \$510.00
  - B. \$564.64
  - C. \$642.22
  - D. \$675.64



Use the following information to answer the next question.

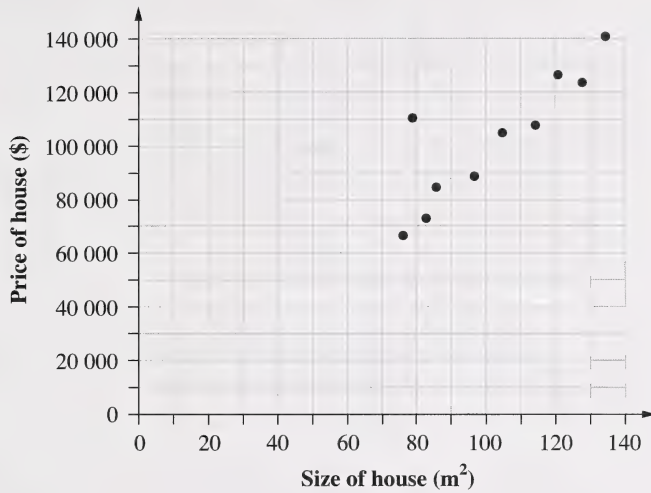
The contractor had building materials delivered from a lumberyard to a construction site. The delivery cost was \$20.00 plus \$0.30 per kilometre.

24. The graph that **best** represents the total delivery cost  $c(\text{\$})$  in terms of the distance  $d(\text{km})$  is



Use the following information to answer the next question.

The contractor used the scatter plot shown below to determine if there was a correlation between the price and the size of the house built.



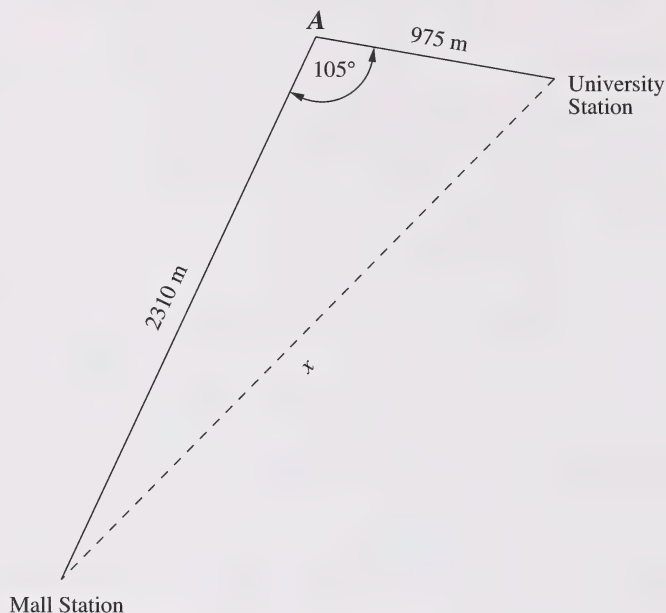
According to this scatter plot, as the size of house   *i*  , the price of house   *ii*  .

25. Which row on the chart correctly completes the statement related to the scatter plot above?

Row	<i>i</i>	<i>ii</i>
A.	decreases	decreases
B.	increases	decreases
C.	increases	remains constant
D.	decreases	remains constant

Use the following information to answer the next question.

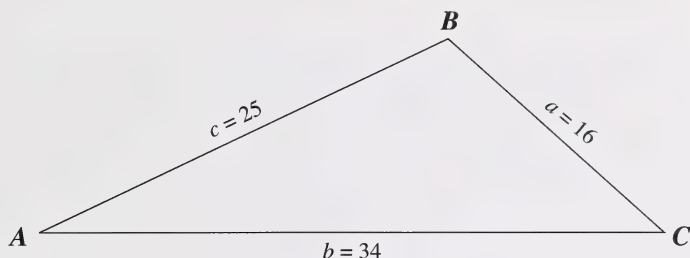
The contractor examined city plans for a light rail transit system. The plans include a tunnel to be constructed between the University Station and the Mall Station. The existing line from point  $A$  to the University Station is 975 m long, and from point  $A$  to the Mall Station, it is 2310 m long. The angle between the two lines is  $105^\circ$ , as shown in the diagram below.



26. The distance  $x$  between the University Station and the Mall Station, to the nearest metre, is
- A. 2231 m
  - B. 2263 m
  - C. 2507 m
  - D. 2730 m

Use the following information to answer the next question.

To design roof trusses, factory workers needed to determine the measure of the smallest angle in  $\triangle ABC$ . They used the Law of Cosines.

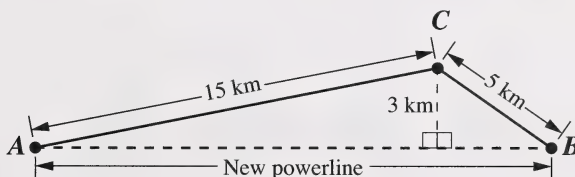


27. The measure of the **smallest** angle in the diagram above is

- A.  $26.2^\circ$
- B.  $32.6^\circ$
- C.  $42.7^\circ$
- D.  $43.7^\circ$

Use the following information to answer the next question.

Utility plans called for the replacement of a 20-kilometre stretch of powerline with a new powerline from A to B, as shown in the diagram below.



### Numerical Response

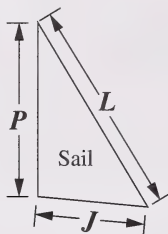
10. The length of the new powerline, to the nearest tenth of a kilometre, is \_\_\_\_\_ km.  
(Record your answer on the answer sheet.)



Use the following information to answer the next question.

Workers at a factory had to program machines to manufacture sails for boats. From a manual, workers determined that the lengths of the sides of the sails should be related as in

$$L = \sqrt{3.2(J)(P)}, \text{ where}$$



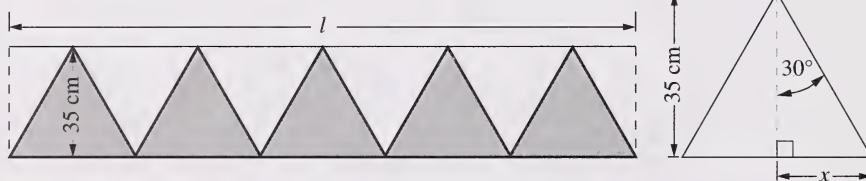
### Numerical Response

11. If  $L = 11.00$  m and  $P = 9.20$  m, then  $J$ , to the nearest hundredth of a metre, is \_\_\_\_\_.  
(Record your answer on the answer sheet.)

\_\_\_\_\_

Use the following information to answer the next question.

A manufacturing plan for a floor support is shown below. Each of the five shaded triangles is equilateral and has a height of 35 cm (an enlargement of one is shown on the right).

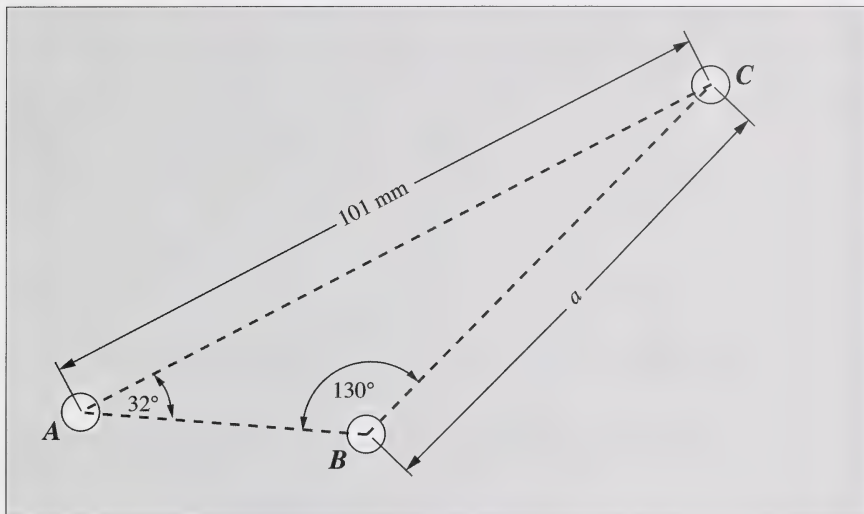


28. The length  $l$  of the floor support is

- A. 101.0 cm
- B. 175.0 cm
- C. 202.1 cm
- D. 210.1 cm

Use the following information to answer the next question.

On a construction project, the contractor hired a technologist to machine holes in sets of metal plates. To determine the length of side  $a$ , the technologist laid out the oblique triangle as shown below.



29. The length of side  $a$ , to the nearest tenth of a millimetre, is

- A. 70.2 mm
- B. 69.9 mm
- C. 53.5 mm
- D. 40.7 mm

**Written Response — 6 marks**

*Use the following information to answer the next question.*

The contractor and a gravel truck driver arranged to meet at a sand pit 10 km away. In travelling to the pit, the gravel truck's speed was 25 km/h slower than that of the contractor's car. The trip took 4 minutes longer by the truck than by car. The chart below summarizes this information.

	Distance Travelled (km)	Average Speed (km/hr)	Trip Time (h)
Car	10	$x$	$\frac{10}{x}$
Truck	10	$x - 25$	$\frac{10}{x - 25}$

From the chart and information given, the following equation is obtained:

$$\frac{10}{x - 25} - \frac{10}{x} = \frac{4}{60}$$

**3.** a. The non-permissible values of  $x$  for this equation are \_\_\_\_\_ and \_\_\_\_\_.

b. Explain why you should use  $\frac{4}{60}$  instead of just 4 on the right side of the equation.

- c. The equation can be simplified to obtain  $x^2 - 25x - 3750 = 0$ . Show how this equation can be solved by using the quadratic formula, and state the **two** values obtained for  $x$ .

$x =$  \_\_\_\_\_ or  $x =$  \_\_\_\_\_

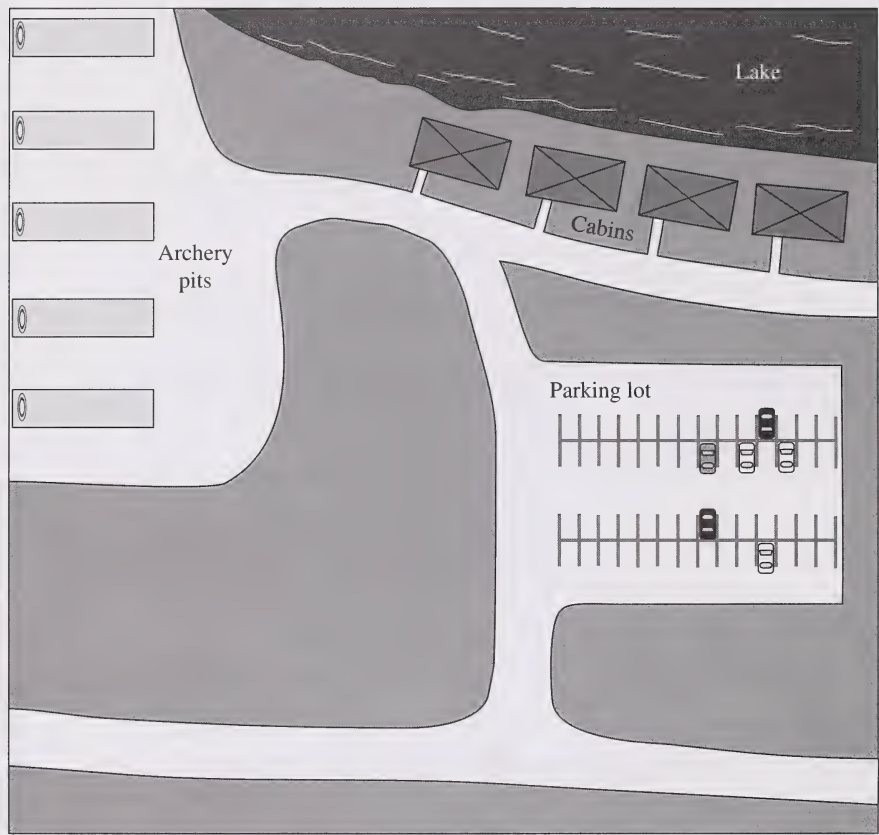
- d. Explain which one of these values is the correct solution for the speed of the car.





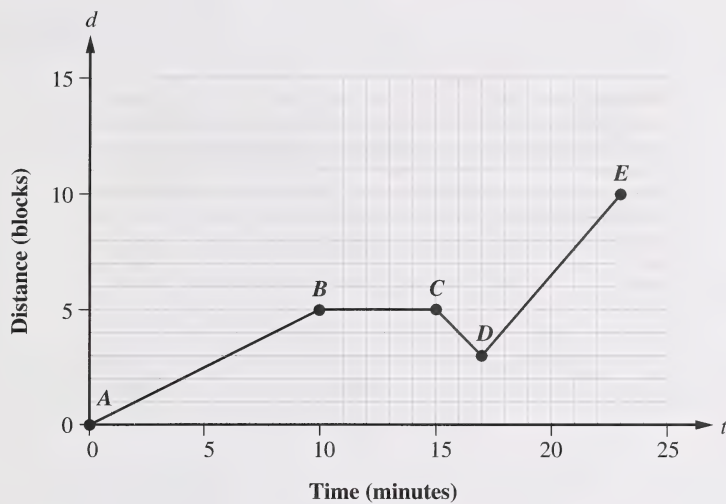
**SPORTS AND RECREATION**

Geri, Bobby, and Leslie went to a summer camp. Answer the following questions related to their experiences at the camp.



Use the following information to answer the next question.

Geri walked to summer camp. The graph below shows her distance  $d$  from the starting point  $A$ , as a function of the time  $t$ .

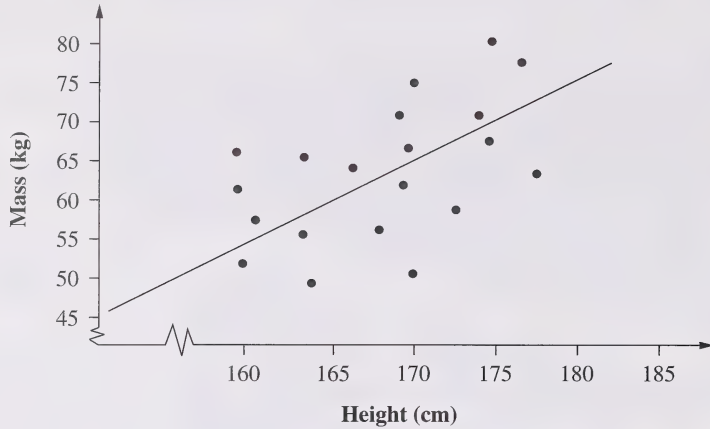


30. Geri's greatest average walking speed was during segment

- A.  $AB$
- B.  $BC$
- C.  $CD$
- D.  $DE$

Use the following information to answer the next two questions.

Bobby drew a scatter plot to show the relationship between each camper's height, in centimetres, and his or her mass, in kilograms, as illustrated below. She then drew a line of best fit.



Use the line of best fit to predict the mass of a student whose height is 175 cm.

### Numerical Response

12. The mass of a 175 cm student, to the nearest five kilograms, is \_\_\_\_\_.  
(Record your answer on the answer sheet.)

31. The correlation for the graph above is

- A. strong negative
- B. strong positive
- C. weak negative
- D. weak positive

Use the following information to answer the next question.

The camp director charges \$2.00 for a bundle of firewood and sells 24 bundles per day. He finds that each time he increases the price by another 25¢ per bundle, he sells one less bundle per day.

A quadratic equation can be used to determine an expression for the maximum income the camp director could earn if the price is increased.

Let  $I$  = income

Let  $n$  = number of increases

$I$  = number of bundles  $\times$  price/bundle

$$I = (24 - n)(2.00 + 0.25n)$$

$$I = 48 + 4n - 0.25n^2$$

$$I = -0.25n^2 + 4n + 48$$

An equivalent expression in the form  $y = a(x - h)^2 + k$  is

$$I = -0.25(n - 8)^2 + k$$

Therefore, the maximum income in dollars is   *i*  , and this occurs when the number of increases is   *ii*  .

32. Which row on the chart shows the correct values of  $i$  and  $ii$ ?

Row	$i$	$ii$
A.	$k$	8
B.	8	$k$
C.	$n$	48
D.	48	$n$



*Use the following information to answer the next question.*

The summer camp program included navigational training on computers and radar screens. The arm that rotated about the centre of a radar screen reminded students of the trigonometry they studied on a coordinate plane. An angle of  $-60^\circ$  was displayed.

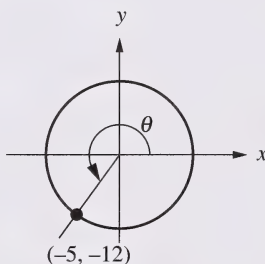
33. An angle coterminal with  $-60^\circ$  is

A.  $420^\circ$   
B.  $300^\circ$   
C.  $150^\circ$   
D.  $60^\circ$

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*Use the following information to answer the next question.*

Geri compared the location of the arm on the radar screen to the angle  $\theta$ , as shown in the diagram below.



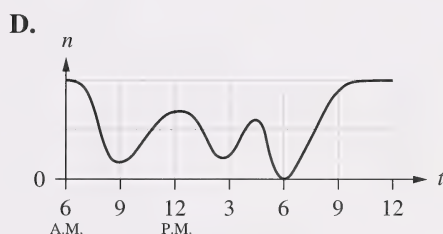
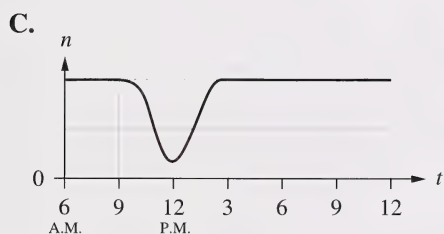
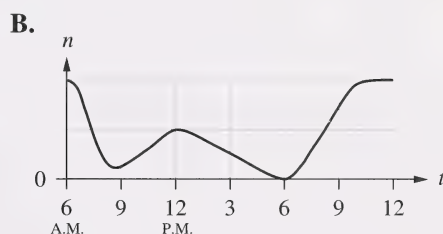
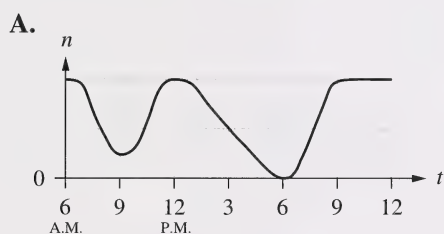
34. The measure of angle  $\theta$ , to the nearest degree, is

A.  $247^\circ$   
B.  $223^\circ$   
C.  $203^\circ$   
D.  $201^\circ$

Use the following information to answer the next question.

Leslie generated a computer graph to represent parking lot usage at the camp. Leslie noticed that the parking lot was full at 6:00 A.M. Between 6:00 A.M. and 9:00 A.M., most cars left. Between 9:00 A.M. and 12:00 noon, some cars returned. Between 12:00 noon and 6:00 P.M., no cars entered the lot and all parked cars left the lot. After 6:00 P.M., cars returned to park for the night.

35. The graph below that **best** represents the relationship between the number of cars parked in the lot ( $n$ ) and the time of day ( $t$ ) is

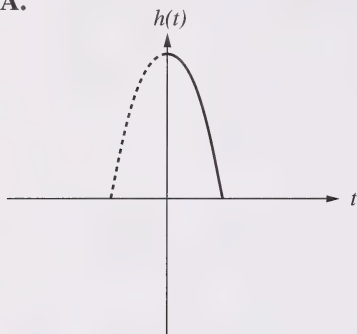


Use the following information to answer the next question.

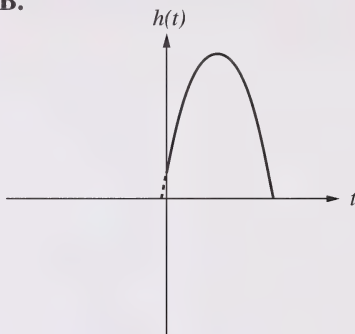
Bobby observed that an arrow shot during an archery session followed a parabolic path for which the height is approximated by the quadratic function  $h(t) = -5(t - 1.4)^2 + 11$ , where  $h(t)$  is the height in metres and  $t$  is the time in seconds.

36. The graph that **best** represents this function for the positive values of  $t$  is

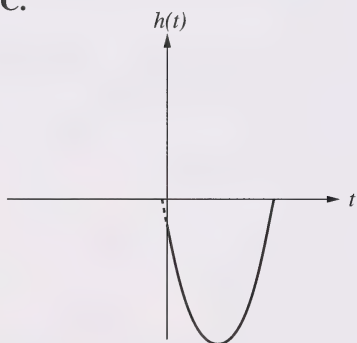
A.



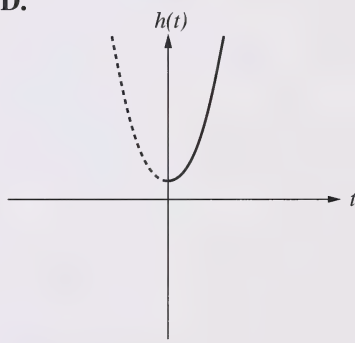
B.



C.



D.



*Use the following information to answer the next question.*

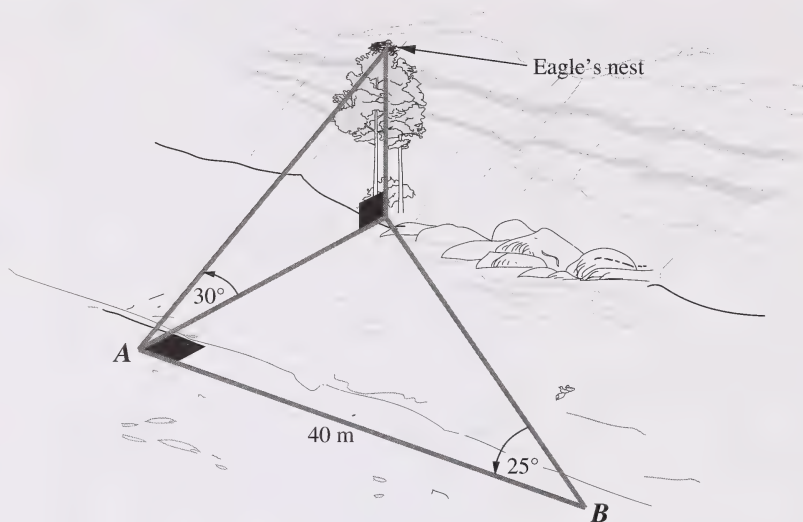
Leslie studied the trajectory of arrows shot during archery practice. Leslie stated that the equation representing the height of the arrow on its path was  $h = -5t^2 + 20t + 2$ , where  $t$  is the time in seconds and  $h$  is the height in metres. Leslie noted that the total time an arrow is in the air (from the time the arrow is shot to the moment it hits the ground) can be determined by equating the height to zero.

- 37.** According to Leslie's equation, the total time that the arrow is in the air before it hits the ground, to the nearest tenth of a second, is
- A.** 2.0 s
  - B.** 3.9 s
  - C.** 4.1 s
  - D.** 5.0 s

Written Response — 4 marks

Use the following information to answer the next question.

During a nature trip, Geri, Bobby, and Leslie documented the location of an eagle's nest. From point  $A$ , the campers observed the eagle's nest on top of a tree directly across a deep stream. The angle of elevation of the nest from point  $A$  is  $30^\circ$ . The campers walked 40 m downstream to point  $B$  and observed that the base of the tree is at an angle of  $25^\circ$  relative to the path on the bank.



4. To the nearest tenth of a metre, determine the distance of the eagle's nest above the ground.

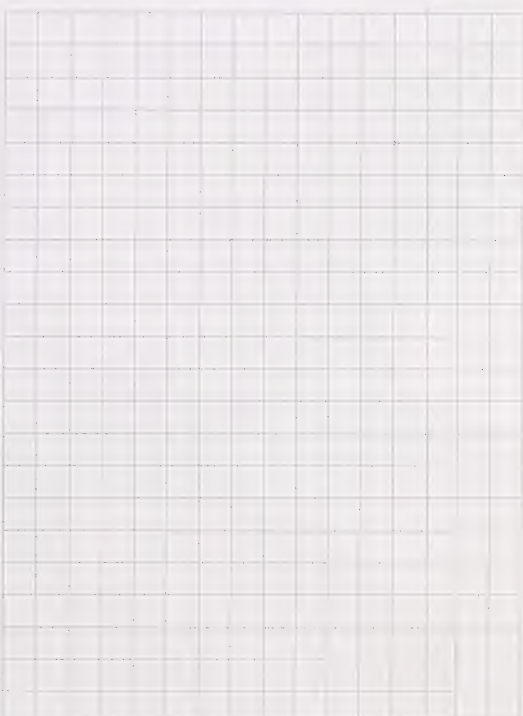
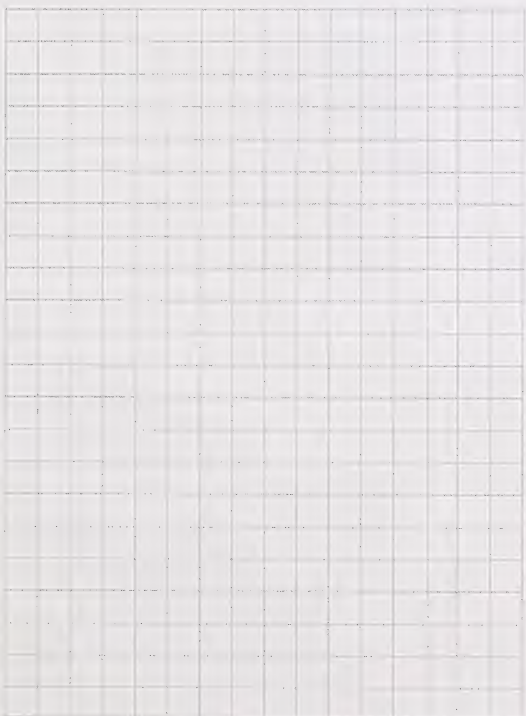
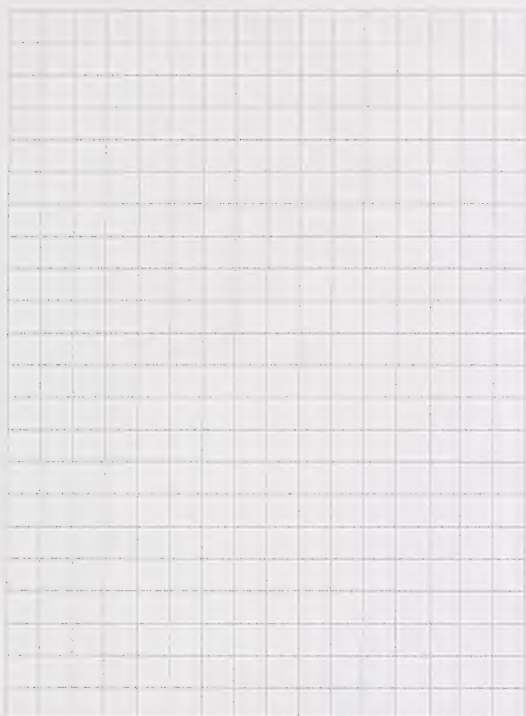






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